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CHAPTER 8

Directions For Defense Digitization of the ROK Armed Forces in the 21ˢᵗ Century

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Introduction

𝒯he ROK Ministry of National Defense defines defense digitization as "the process of transforming the overall defense structure into the information and knowledge-based network, using the latest information technology consisting of computers and high-tech communications equipment." Its ultimate goal in war is to support command and control and bring about a quick victory by providing real-time battlefield intelligence and, in peacetime, to guarantee the economical operation of the military via efficient defense resource management.[77]

In order to fulfill these goals, the MND selected five core areas of concentration and 15 main projects, and classified them into stages as part of the digitization policy of the ROK military.   The first stage involves laying the foundations for digitization by building an ultra-high speed

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[77] See *"The Defense White Paper 2000,"* Part Three, ROK Ministry of National Defense, Seoul, ROK, 2000

defense information communications network by 2005 and, in so doing, first build the command and control system (C4I) and the defense resource maintenance system which will function as the core systematic foundation for defense digitization. The second stage will involve considerable increases in the processing capabilities, integration of various systems while keeping up with the information technology environment by 2010 and, in the process, seeking to maximize efficiency in systems maintenance. The third stage will entail the construction of all-encompassing defense digitization systems appropriate for a knowledge-based information society by 2015. The goal of these measures is to propel the ROK military into the top 10 ranking of militaries in the world in the area of the digitization.

This chapter will discuss the current status and problems facing the program of defense digitization in the ROK armed forces. The author will introduce the Korean vision and outline the main objectives of defense digitization. He will also lay out the government strategy of promoting digital defense and highlight basic directions and proposed steps in defense digitization in the Republic of Korea.

Challenges of the Information Age and Defense Digitization

In the information age, power is increasingly derived from information sharing, information access, and speed. Thus, network-centric warfare is the military expression of the information age.[78] Network-centric warfare fueled by the information technology revolution is at the heart of defense

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[78] For further description of the concept of the network-centric warfare, see *"Military Transformation: A Strategic Approach,"* Office of Force Transformation, Office of the Secretary of Defense, Pentagon, Washington, D.C., Fall 2003

force transformation and the emerging new way of fighting war.[79] Future warfare will not be mobile warfare centered on manpower and materiel. Instead, it will evolve into an integrated information systems warfare, which will integrate battlefield functions where each service of the military will be an essential element of future warfare.[80]

Future warfare will be knowledge-based warfare, which will require low-cost, high-efficiency, knowledge-based defense systems of next generation. It will be predominantly information warfare, focusing on "soft kill" rather than "hard kill." It will involve precision attacks executed with superior information. The information warrior will come to replace the maneuvering warrior.

In order to prepare for the knowledge-based warfare, during the peacetime, there will be considerable environmental changes in defense management. The workload will be significantly increased. More knowledge will be required, but much less human manpower will be needed, which will require systematic innovation and revolution in defense management systems. The military structure will have to be downsized and made more efficient. It will be knowledge-based, online, and on time. The information paradigm itself will have to be changed. Individual systems, the core systems of future warfare, will have to be digitized and automated. They will have to be integrated physically and hierarchically, as well as organically and vertically. Technology-oriented development will have to be substituted with the user-oriented development.

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[79] See *"Creating a Decisive War-fighting Advantage,"* Director, Force Transformation, Office of the Secretary of Defense, Pentagon, Washington, D.C., Winter 2003
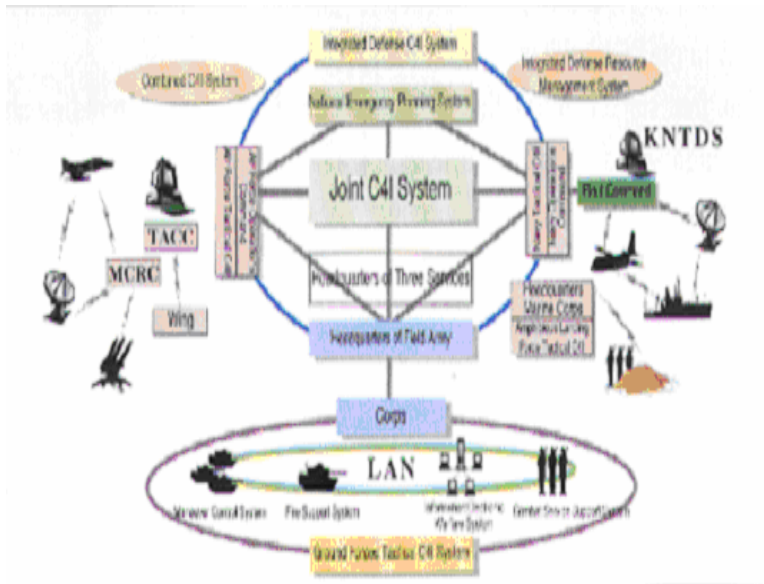
[80] See *"The Defense White Paper 2000,"* ROK Ministry of National Defense, Seoul, ROK, 2000, chapter three

The new rules of the network-centered warfare will include information superiority, speed of command, shared awareness, dispersed forces and noncontiguous operations, demassification, self-synchronization, deep sensor reach, alteration of initial conditions at higher rates of change, and compression of levels of war. What is valued in network-centered warfare is networking, sensing, envelope management, speed/endurance, numbers, risk tolerance, and staying power.[81]

To prepare for such a battlefield environment, the ROK military is in the process of constructing an integrated defense C4I system, joint and combined C4I systems, and a tactical C4I system for each service of the military. An integrated defense C4I system (see Figure 8.1) would be the core of the joint C4I system and, in times of war, a national emergency planning system and a combined C4I system will also be coordinated with the integrated defense C4I system to completely command and control national warfare. To this end, the basis for a national information system and the coordinated maintenance operation environment will be constructed prior to other initiatives.

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[81] See *"Creating a Decisive War-fighting Advantage,"* Director, Force Transformation, Office of the Secretary of Defense, Pentagon, Washington, D.C., Winter 2003

Figure 8.1 Integrated Defense C4I System Diagram

Source: "Defense White Paper 2000," ROK MND, Seoul, December 2000, chapter 3, Figure 3-6

Current Status and Problems in Defense Digitalization

Since 1999, the ROK Ministry of National Defense pressed ahead with building a joint C4I system on the basis of the Command Post Automation System (CPAS), which is supposed to integrate joint military information systems, joint operations planning, programming and execution system, and combined war game systems. Additionally, Global Command and Control System-Korea (GCCS-K) and an information collection system, which are used for coordinating Korean-American efforts, will be integrated

with the joint C4I system in order to gain superiority in battlefield information-gathering abilities and to promote the efficient operation of the C4I system.

The C4I system in each service is being built in sequential stages in order to focus on essential functions and accommodate the different missions and battlefield functions of each service. The tactical C4I system for each service forms the lowest level of the command and control structure in which the information collection assets, or sensor, and strike capabilities, or shooter, are connected in real time. Such a system will be coordinated with the joint and combined C4I systems so as to allow smooth interface between the information collection system and the weapon systems.

The goals of the ROK Army are to automate the battlefield functions of tactical echelons of the corps-level and below, and then establish an integrated combat-management system. Bearing this in mind, in 1999, the army built and operated a demonstration system in one of its operational units and, as a result, sequential stages are set around the essential functions to improve capabilities and seek systematic expansion simultaneously.

In the ROK Navy, the Korean naval tactical data system, which automates the processing of surface and vessel situation information, is already in full operation in certain theaters of operation, and its operational areas will be expanded. At the same time, some of the capabilities will be complemented to allow the processing of surface-situation information in real time that would make integrated surface operations command and control possible. Such improvements would upgrade the KNTDS into a potent tactical C4I system and allow coordinated operations with the ROK Army and Air Force.

The tactical C4I system of the ROK Air Force is the Master Control and Reporting Center and, because its features are aging and nearing obsolescence, construction of the second MCRC was completed in 2002 for use in tactical operations. The second MCRC is coordinated with the command and control and the information collection system for tactical wings to build a fully coordinated C4I system. Such a system would allow coordinated operations with the ROK Army and the Navy.[82]

The development of network-centric capabilities for digital defense is not the end in itself. If the ROK armed forces fail to apply their emerging network-centric capabilities to achieve strategic, operational, and tactical objectives, these capabilities will be of little value. At present, there are a number of problems and challenges facing defense digitization that can undermine the long-term prospects of digital defense in the ROK armed forces.

Firstly, the ROK Army, Navy, and Air Force have to cope with large deficiencies and visible shortages in the development of basic IT infrastructure in the military sector. Specifically, the number of available personal desktop and laptop computers is insufficient. Local area networks are still limited, and the wide area networks are slow in speed and can hardly be used for large volume data exchanges.

Secondly, the services still need to develop their own independent systems, i.e., information islands, which require the establishment of efficient standard procedures and appropriate security systems. Then, they will have to

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[82] See *"The Defense White Paper 2000,"* Part Three, ROK Ministry of National Defense, Seoul, ROK, 2000

join their efforts in the development of a joint master system for generating a common operational environment.
At present, there is no long-term master plan for the development of centralized network-centric capabilities. Consequently, similar systems are developed in many places, that leads to the waste of personnel time, money, and efficiency.

Thirdly, current program management is inefficient. It is a one-time development process. It takes a long time to accomplish, and by the time a system is completed it quickly becomes obsolete. Further, the program maintenance system is not known for its efficiency. Often programs are insufficiently developed for the end-user's requirements. There is little consideration of the status of current information or economic environment.

Vision and Objectives of Defense Digitization

In the digital information age, the ROK armed forces should become "powerful forces based on information knowledge." They should be able to achieve "4R" in personnel, process, and system, namely the "right information delivered to the right user at the right time in the right form. Figure 8.2 shows the key components of the future vision of digital defense in the ROK.

Figure 8.2. Vision of Defense Digitization in the ROK
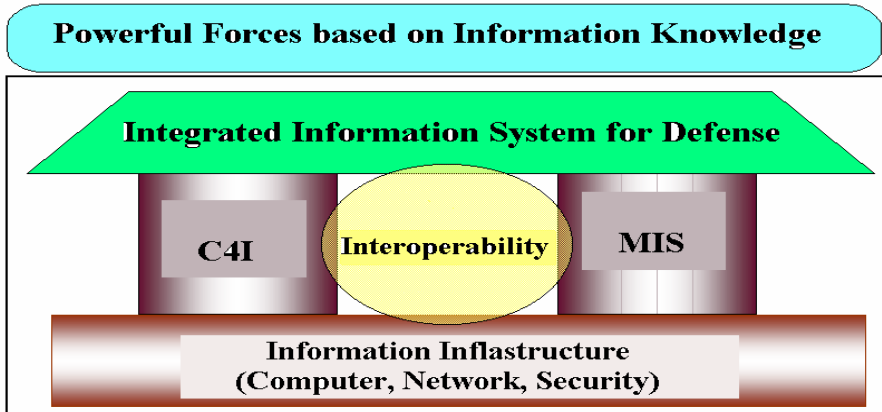
In order to implement the above-mentioned vision, the ROK armed forces should pursue the following strategy of defense digitization. Planning and control must be centralized, whereas programming and execution must be decentralized. Digital defense must be developed in an incremental and evolutionary way. Interoperability must be assured. The system must be user-oriented. The military must cooperate with the civilian government and the private sector to achieve the objectives of defense digitization. Special attention must be paid to system assurance and system integrity in light of existing threats of information warfare and cyber-terrorism.

Main Directions of Defense Digitization

Defense digitization proceeds along many venues in the ROK armed forces. The first direction is the construction of a comprehensive system for the knowledge-based

information warfare of the future. The ROK armed forces build a military defense system that will enable the nation to win in the war by seeing and sensing faster, acting faster on the available information, and delivering pinpoint attacks of significant destructive power with precision-guided weapons from long distances. Accordingly, the Ministry of National Defense and all services are engaged in constructing an efficient C4ISR system, a joint/integrated command and control system, a technical command and control system, and joint military intelligence system, while promoting the revolution in military affairs in all services and units (see Table 8.1).

Table 8.1. General Step-by-Step Objectives of Defense Digitization

| Step	Period	Objectives	Main Tasks
1st	2001-2005	Infrastructure Core System Construction	Rearrange Information Environment: LAN/WAN, C4I, CALS
2nd	2006-2010	Extend capability, System integration	High-speed WAN, Integrated C4I
3rd	2011-2015	Leading Edge System	Construct high-speed WAN, full operational availability in the military

Secondly, in order to build the base of an IT-based digital defense system that would allow for the real-time information processing, the ROK military has to improve its communication networks significantly, relying on the

government high-speed network for the backbone, using the Internet for military purposes, and constructing its own wireless/satellite network and data links. Accordingly, the MND plans to construct its own defense digitization communication system, which is designed to guarantee the production, preservation and flow of all military information necessary for war-fighting and defense-related activities. It is a system that interconnects the strategic and tactical information communication systems linked with the national ultra-speed information network and the satellite communications network, which will be implemented on a gradual basis. Such a system calls for the formation of a WAN and a LAN in regimental units or higher echelons from 2001 to 2005. Additionally, each unit will possess a synchronous transfer mode switch to process large quantities of military information, starting as early as 2006.[83]

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[83] See *"The Defense White Paper 2000,"* Part Three, ROK Ministry of National Defense, Seoul, ROK, 2000

Figure 8.3. Defense Digitization Communication Network System in the ROK
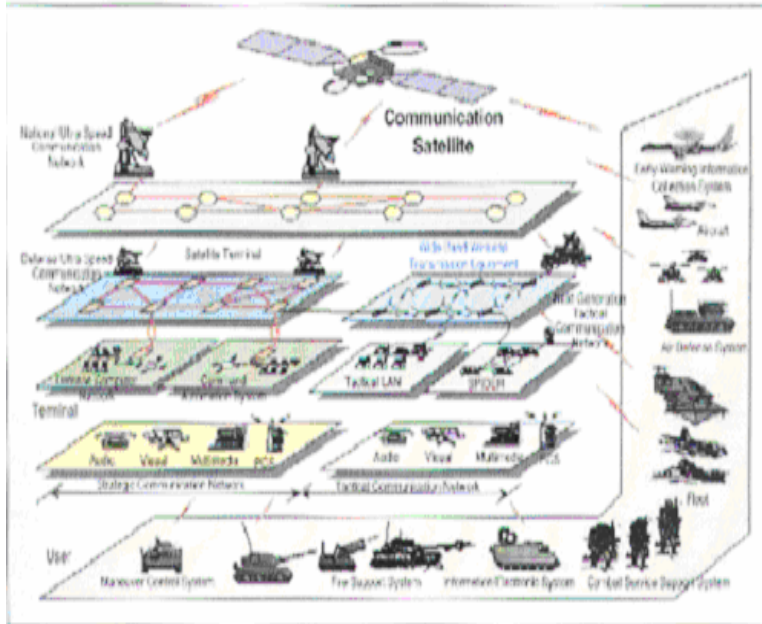
Source: "Defense White Paper 2000," ROK MND, Seoul, December 2000, chapter 3, Figure 3-9

Furthermore, the defense digitization communication network is being built with the intent of securing wideband information processing and real-time synchronization of operations among the Army, Navy, and Air Force. These efforts will lead to the construction of a defense digitization communication system for real time, ultra-speed processing of large blocks of military information by 2005.

The third direction of defense digitization is ensuring network security for the defense digitization

communication network. Due to the rapid developments of the digitization and information processing capabilities of the military, large quantities of military information are being processed at a high speed and with increased accuracy; such advancements result in increased risk of information leaks.

To counter such a possibility, the defense digitization network will be closed to outsiders, and it will operate independently from the Internet and other outside networks. Additionally, operating a security lock between each unit will ensure prevention of information leakage along communication lines between separate units. All the information will be fully encoded to completely prevent hacking on inter-unit lines, and the main PCs in each unit will have their own security mechanism installed to prevent information leaking from CDs and diskettes. Later on, in order to prepare for the eventuality of increased information exchange via the Internet and advancements in communication technology, increased efforts will be directed towards developing methods for hardware and software security encryption.[84]

Concurrently, all major communication routes will be monitored with increased scrutiny by the formation of a computer emergency response team that will work to prevent all computer-related problems and seek responsible response efforts. Later, a security breach-attempt recognition and security lock-up mechanism will be installed under the guidance of CERT and its role will be expanded.[85]

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[84] *Ibid.*
[85] *Ibid.*

On the other hand, to ensure that the computer security-related human-resource pool is not drained, there will be a selection and reclassification among officers to be trained in the security-breach area. Enlisted service members' civilian education files will be screened for information and technology-related majors. Among the officers selected, there will be increased opportunities for advanced education in the academia of Korea and the rest of the world. Furthermore, inter-ministerial efforts to prevent security breaches via the communication network will be sought among various divisions of the government on a cooperative basis.

Establishment of a resource-management system for efficient defense administration is the fourth main direction of defense digitization in the ROK. The ROK MND established the defense CALS master plan in 1997 and pushed hard to complete the construction of a defense CALS based on this plan in order to automate the acquisition and disposition of defense-related items throughout their life cycle so that there would be no waste of the defense budget.

For a smooth operation of the defense CALS system, MND intends to standardize the operating procedures while concurrently pressing for the development of the complete system. At the same time, MND spends a lot of money for the acquisition of computing equipment and a digital communication network.

When the defense CALS system is completely set up for front-line units with respect to ammunition, equipment maintenance, transportation, and facilities information systems, the online real-time mode will be the functioning mode under which all the units of the ROK military and the MND operate. Furthermore, an integrated database system

will be established for joint operation of all the services (the army, the navy, and the air force) and a real-time display of crucial information and efficient supply support will be realized (see Table 8.2).

Table 8.2. Objectives of Defense Digitization Related to Military Industry Support

Class	1st ('01-'05)	2nd ('06-'10)	3rd ('11-'15)
CALS	Ammunition, Supply Transportation	Procurement CALS	Complete CALS
Electronic commerce (EC)	Facilities	Armament EC	Complete MIS-wide Electronic Commerce
Others	Budget Medical Personnel Intelligence	Database for decision-making	DW Finish database for decision-making

Because of recent developments in the Internet, the global economy is shifting towards the paradigm of electronic commerce and under such a rapidly evolving environment, a nation or an institution that cannot adjust to the changing milieu of commerce will fail to survive in the 21st century, called the time of infinite competition.

To adjust to the shifting paradigm of commerce, the ROK government makes every effort to increase the nation's competitiveness and build a knowledge-based management structure into existing industries. To this end, the ROK government has selected the acquisition and supply chain

of the ROK military as the route on which the "model project for government-industry electronic commerce" will be carried out. Accordingly, MND has built the Defense Procurement Agency management information system, and peripheral system inter-connecting MND, industry, and financial institutions for information sharing and exchange. Since 2000, in conjunction with government integrated technical information system, the procurement electronic data interface has been set for an expansion that created a customer-oriented information system by which a procurement technical information service, electronic auction, and expanded Web-services became available.

Subsequently, according to the defense CALS total development plan, a military supply system that integrates the process from acquisition stage to the actual operations at the field unit was constructed and such a system was interwoven with the ROK government, civilian, and foreign defense-related systems so as to make real time support possible during times of peace and war.

From 1995 to 2007, the MND is concentrating its activities on the establishment of a foundation and expansion of capabilities of a functional defense resource management system by building a comprehensive defense budget management system and human resources management system, among others. For each service, and for each of the functions (personnel, adjutant, judge advocate, military police, inspector, intelligence, etc.), the system will be expanded in the construction process. From 2007 to 2010, this system will be integrated to include MND and the field units, and crucial data classified according to functionalities will be stored in the policy databases. The policy DB will be developed to aid in the decision-making process. Additionally, by 2015, a system comparable to the standards of advanced nations will be completed. During

this time, a comprehensive defense resources management database and a decision guidance system for service branch or function should be completed.[86]

Implementation of office automation system is the fifth direction of defense digitization process in the ROK armed forces. Since 1996, MND has pressed ahead with the agenda of realizing small but efficient digital defense and paperless defense administrative work by adopting and implementing the defense office automation system in the entire military. Such an office automation system is set for transformation into a Web-based environment and relies on the latest information technology. As of 2000, division and brigade units had the LAN infrastructure in place and, in 2004, regimental units had their proprietary LAN installed. As of 2001, administrative personnel in the division and brigade units had one PC per person to carry out their duties and, gradually, PC's will be supplied to administrative personnel at the company level (see Tables 8.3 and 8.4 for details).

Table 8.3. Objectives of Defense Digitization Related to Hardware Procurement

Class	*1st ('01-'05)*	*2nd ('06-'10)*	*3rd ('11-'15)*
Main	- More - Power system	Distribute System, Mobile/light	Mega center
PC	Every office worker	- Small/light - More laptop	Intelligent PC
Periphery	EDMS	New tech	Leading edge

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[86] See *"The Defense White Paper 2000,"* Part Three, ROK Ministry of National Defense, Seoul, ROK, 2000

Table 8.4. Network-Related Objectives of Defense Digitization

Class	1st ('01-'05)	2nd ('06-'10)	3rd ('11-'15)
Strategy	LAN, WAN	More ATM	High-speed NW
Tactics	Mobile Wireless LAN	Start ATM	Finish ATM High-speed NW
Satellite	More corporate satellite	Corporate/military satellite	Finish military satellite

Finally, educating enlisted service members for digital defense is the sixth direction of defense digitization in the ROK armed forces. The ROK MND prepares for future conflicts by fostering an elite force, and transforming the enlisted men into a productive factor in the knowledge-based information society by educating them on the digitization efforts along the lines of national digitization education policy.

To this end, MND seeks to train digitization experts that will allow efficient operation of the defense information system. These educational efforts are carried out while considering each unit's specialties and assignments. An organized education atmosphere is built according to these considerations.

Table 8.5. Objectives of Defense Digitization Related to Education and Training

Class	1st ('01-'05)	2nd ('06-'10)	3rd ('11-'15)
Computer-based training (CBT)	Common CBT	Remote Education CBT Network	Complete Cyber Education and Training
Decision-making & Support	Develop WG model Infrastructure for distribution of WG model	Interface C4I/M&S Own Integrated WG model	Integrated WG model Complete Cyber Education and Training Center

Currently, 150 division and brigade-level or higher units plan to be equipped with digital education facilities, and approximately 60 units operate such education facilities. Since 2000, education facilities in 90 additional units have been built for improving the digitization education atmosphere. Also, since April 2000, approximately 1,600 battalion units have been furnished with digitization education facilities to allow Internet information retrieval engineer license education to be carried out for the 270,000 current enlisted men and people who have finished their obligatory military service requirements. 6,800 company level units were provided with PC education facilities for digitization education (see Table 8.5). The ROK military has built a digitization education environment to increase the operative capabilities of the defense information system and nurture experts in digitization within the armed services. Additionally, in order to keep up with the knowledge-based information society, plans for distance

learning and a virtual education system have been implemented to systematically establish an education system for the digitization of the officers and enlisted men.

Conclusion

The IT revolution sweeping the Republic of Korea necessitates the military transformation of its armed forces. Defense digitization is the mainstream of military transformation in the ROK Army, Navy, Air Force, and Marine Corps. The ROK forces must leverage information technology and innovative network-centric concepts of operations to develop increasingly capable forces. New information and communication technologies hold promise for networking highly distributed joint forces and for ensuring that these forces have better situational awareness about friendly forces and those of adversaries and more precision-guided lethal power.

Command, control, communications, computers, intelligence, surveillance, and reconnaissance systems draw combat power from the networking of a multitude of platforms, weapons, sensors, and command and control entities, which are collectively self-organized through access to common views of the battlespace. Defense digitization brings the ROK armed forces closer toward network-centric warfare that places a premium on connectivity and interoperability as critical performance factors. The knowledge-based defense system using new IT is essential for achieving the full-spectrum dominance and the conduct of operations on the principle of "all for one, one for all."

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